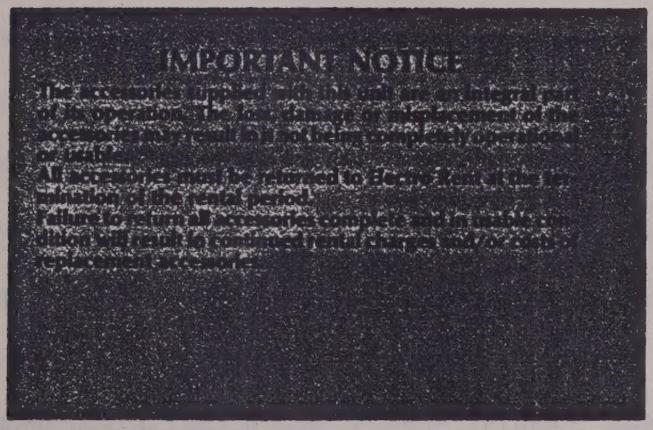
OPERATION MANUAL

FOR

MODEL 206-2



NICOLET
INSTRUMENT
CORPORATION
OSCILLOSCOPE DIVISION

C. Model 205/206 Plug-In Operating Controls

1. The Storage Controls

The LIVE pushbutton, when depressed momentarily, allows the instrument to respond to both signal input and trigger input as selected. A valid trigger will cause new information to replace the old.

The HOLD NEXT pushbutton allows one more sweep, only to be triggered, after it is depressed when operation is "Live".

The HOLD LAST pushbutton, when momentarily depressed, allows no further triggering but if a sweep is already in progress, it allows that sweep to be completed.

The RETAIN REFERENCE switch, when "on", prevents new signal information from being entered into alternate memory locations; half the data points then indicate the "Live" ongoing signal waveforms and half represent the older waveform being protected. The effect is to allow waveforms to be compared closely, one of the waveforms being stored, the other "Live".

When operating in the "Cursor Trigger" mode (See Section IV, C.5.b.2) the change to or from the RETAIN REFERENCE mode takes place at the end of a sweep, if the plug-in is kept in Live. Whenever the LIVE button is depressed, the RETAIN REFERENCE mode, either on or off, is entered into the 206 control logic. In other triggering modes, altering the switch position causes this mode to take affect at the beginning of the next sweep and therefore, the protection is effective more immediately.

2. The TIME PER POINT Control

This switch allows selection of sweep speed of 500 ns per point and exact multiples (2, 5, 10 etc.,) of 1 µs. up to 200 seconds per point. You should not change the position of this switch during long sweeps, if you do not wish information to be lost, inpart.

3. CHANNEL ON-OFF Switches

The Model 206 plug-in unit can be used as a single channel unit if the unused channel is switched off. Switching off both channels is physically possible, but an incorrect operation. If this is done, the instrument may appear to operate correctly with certain settings of the MEMORY switch and trigger source, but with other settings of these switches the instrument will not operate correctly. Therefore, be sure to have one channel "on".

If you wish to examine only one signal source, you will be using only one amplifier; the other signal channel should be switched off. Even when it is switched off, you may use the second signal amplifier to receive a trigger signal from another source, rather than using the EXTERNAL trigger signal input.

4. TRIGGER THRESHOLD and TRIGGER SLOPE

When the trigger signal voltage crosses the threshold level selected by this control, a sweep is triggered if the oscilloscope is in the "Live" mode. It is a positive transition which causes the sweep to start if the TRIGGER SLOPE switch is in the "AC+ or DC" position" otherwise it is the negative transition.

In the case of positive transition triggering, the trigger signal voltage must recross back below the threshold after the trigger has occurred and must drop below that threshold voltage by an appreciable amount, before another trigger can occur. This requirement is to prevent infinite sensitivity. The same is true for negative transition triggering, but in the opposite direction.

The amount by which the trigger signal must continue beyond the threshold during the recrossing after a trigger has occurred determines the sensitivity. The sensitivity is nominally 0.5 volts for external triggering. It is nominally one tenth of the full scale range selected, for internal triggering.

The AC coupling time constant is 0.1 seconds. The external trigger circuit input impedance is 1 Megohm. The external trigger voltage should not exceed $\pm$25 volts.

5. Trigger Controls

a. TRIGGER SOURCE Selection

The 206 plug-in allows sweep triggering to be initiated by either an externally provided signal, or from the signals from the amplifier of either channel A or B. When internal triggering is in use, for example by means of the signal from the channel A amplifier, the A channel is usually "on" (See Section IV, C.3), and the signal is displayed on the screen. If channel B is also "on", two waveforms are displayed, those applied to each of the two amplifiers.

If channel A is switched "off", the signals applied to it continue to cause triggering, and in this situation the "B" waveform continues to be displayed if the "A" signal continues to provide suitable trigger signals.

This is conventional in modern analog oscilloscopes, also. The purpose in using one channel for triggering, even if its waveform is not displayed, is to allow the signal being used for triggering to be "conditioned", i.e., amplified, attenuated, level shifted, or filtered, by the amplifier. It also allows you to "see" the signal if you temporarily switch that plug-in unit channel "on", thereby allowing you to confirm that what is causing the triggering is really what you want to cause it; and that the trigger threshold is set at a safe level above noise and also safely below the maximum point of the triggering signal feature.

The 205 plug-in unit provides a choice of external or internal triggering. Both plug-in unit types also provide for manual pushbutton triggering, which is used when no trigger signal feature is present, such as at the beginning of a long measurement of some variable such as room temperature.

b. The NORM-AUTO-CURSOR TRIGGER MODE CONTROL

1. NORMAL and AUTOMATIC Triggering (205/206)

Normally, triggering is produced in a conventional manner. The AUTO trigger mode is one in which another sweep is caused to occur automatically, if no trigger occurs within 22 milliseconds after the preceding sweep is ended. The automatic triggering is used principally during set-up procedures.

2. The CURSOR TRIGGER MODE (206 Only)

Cursor triggering is the mode which allows observation of signal regions both preceding and following the trigger time. How much pre-trigger information, and how much post-trigger information will be shown is determined by the position of the vertical marker line (the cursor) displayed on the screen when an unexpanded display is in use.

It is ordinarily just as easy to use this mode of triggering as the NORMAL mode. There is one situation which should be kept in mind, however. During the use of very slow sweeps it will be observed that information is not transferred to the main frame for display until the sweep is completed. You might sometimes observe by means of the TRIGGERED led on the panel that a trigger has occurred, yet nothing seems to be happening. You may even suppose that there has been a malfunction, especially if the sweep is very long in duration. It is not a malfunction; when the sweep ends the signal waveform will be displayed.

The CURSOR TRIGGER mode is sometimes referred to as the "mid-signal trigger" mode. It is made possible by recording into the plug-in unit memory continuously, but not transferring that information to the main memory for display until some time after the trigger signal is received. The buffer memory contains past history, therefore, that will be used to indicate the signal waveform that corresponds to the signal that existed before the trigger. In the period before the trigger, the buffer may become "full", after which the oldest information is discarded to make room for the most recent. Usually that buffer contains 4096 data "points", therefore.

When a trigger occurs, this process is allowed to continue for a time, the length of time depending upon the position of the vertical marker line, the cursor. At the end of that time, the contents are transferred to the main memory. The "pre-trigger-time" information is therefore displayed, followed by the "post-trigger" information. The act of transferring information to the main memory consumes typically 2 milliseconds, and for practical design reasons, all information is discarded from the buffer, at that time. This means that the next trigger cannot be allowed to happen until the buffer again contains a sufficient amount of "new" history. If it occurs too soon, it will be ignored by the oscilloscope.

This is an important consideration in the case of very slow sweeps. Suppose, for example, that you want to observe what precedes an event that you expect might happen during the night. You may then select a sweep time of 11.5 hours (10 seconds per point if you are using the full memory and a single input channel). If you need to see what happened before the event, an hour of information for example, you will set the cursor to a position about a tenth of the way from the left of the screen. There must be at least one hour of running before a trigger will then be accepted. You must place the instrument in the CURSOR trigger mode, and press the LIVE pushbutton at least an hour before the event is expected in this

6. The DC LEVEL Control

This should normally be set to a position which causes the trace to be at the zero voltage position when the signal probe is removed from any signal source. The numerical voltage value displayed indicates trace level. When measurements require high accuracy, this setting should be checked with appropriate care. DC level drifts of as much as 0.025% of full scale per hour, even at constant temperature, can be expected except in the case of drift-stabilized plug-in units. Furthermore, amplifier gain switch selection changes can introduce DC level offset changes of as much as 0.1% of full scale.

7. External Sweep Timing Control

The Model 206 plug-in unit includes the capability of allowing external control of sweep timing, in place of the internal crystal oscillator control. This feature is referred to as the "External Address Advance" capability.

This capability is provided when the TIME PER POINT switch is placed in one of the three positions counterclockwise from the 500 ns position.

The Model 206 plug-in provides three external timing modes:

MODE 1: This is referred to as the "fast, non-synchronous" mode. In this, the first externally provided timing pulse acts as a sweep trigger pulse and as the first "sample" command.

The following pulses each act as "sample" commands, and when they occur the signal is measured and recorded within 650 ns, until the "sweep" is concluded following 1024, 2048, or 4096 such commands, depending upon the size of the memory group being utilized.

The pulses are applied to the INPUT BNC connector, and it is necessary to use the NORMAL triggering mode, and the EXTERNAL SOURCE triggering mode should be used. The trigger threhold level control, and the polarity and AC/DC coupling controls are used in a normal manner, and control the response to these externally applied pulses.

Use the first position counterclockwise from the 500 ns position, for this mode.

Note that there is limited sychronization of timing. There will be a delay of from 150 to 650 ns following each applied pulse before the signal is actually measured.

In this mode, the timing pulses must not occur with a spacing less than 500 ns.

MODE 2: The Model 206 provides a second external timing mode, with 400 ns delay and 25 ns timing uncertainty, but in which the minimum pulse spacing allowed is 1.5 μsec. The second time base switch position counterclockwise from the 500 ns position is used for this mode.

MODE 3: The third unmarked position counterclockwise, of the Model 206 time base switch, provides a slow, synchronized mode. Minimum external timing pulse spacing is 4 μsec, and time of measurement delay of 400 ns and 25 ns timing uncertainty. Unlike MODE 1 and MODE 2, this mode allows the waveform of the signal being measured to be observed during the sweep rather than afterwards.

NOTE: On units shipped before September 1, 1978, MODE 2, under certain circumstances does not operate correctly. If MODE 2 is required, please consult Nicolet in Madison, Wisconsin. Also, MODE 3 is nonsynchronized on units shipped before September 1, 1978.

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